



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

April 19, 2018

Mr. Joel W. Duling
President
Nuclear Fuel Services, Inc.
P. O. Box 337, MS 123
Erwin, TN 37650

**SUBJECT: NUCLEAR FUEL SERVICES, INC. – U. S. NUCLEAR REGULATORY
COMMISSION INTEGRATED INSPECTION REPORT NUMBER 70-143/2018-002
AND NOTICE OF VIOLATION**

Dear Mr. Duling:

This letter refers to the inspections conducted from January 1 to March 31, 2018, at the Nuclear Fuel Services, Inc. (NFS) facility in Erwin, Tennessee (TN). The purpose of these inspections was to determine whether activities authorized under the license were conducted safely and in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements. The enclosed report presents the results of the inspections. The findings were discussed with members of your staff at the exit meetings held on February 8 and after the end of the quarter on April 18, 2018.

During the inspections, NRC staff examined activities conducted under your license, as they related to public health and safety and to confirm compliance with the Commission's rules and regulations and with the conditions of your license. Within these areas, the inspections consisted of selected examination of procedures and representative records, observations of activities, and interviews with personnel. The inspections covered the following areas: safety operations, radiological controls, facility support, and other areas.

Based on the results of the inspections, the NRC has identified a Severity Level (SL) IV violation (VIO) of License Application, Section 4.7.12.4, "Criticality Detection System," with two examples. This violation was evaluated in accordance with the NRC Enforcement Policy. The current Enforcement Policy is included on the NRC's Web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>. The violation is cited in the enclosed Notice of Violation (NOV). The NOV and the circumstances surrounding it is described in detail in the subject inspection report.

The violation is associated with first, the failure to ensure that, while in Storm Mode, the Criticality Accident Alarm System (CAAS) would respond to the minimum accident of concern, as required by American National Standard (ANS) 8.3, Section 5.6, "Detection Criterion," and second, the licensee failed to periodically test the Storm Mode logic when they tested their CAAS, as required by ANS-8.3, Section 6.4, "Periodic Tests."

You are required to respond to this letter and should follow the instructions specified in the enclosed NOV when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the NOV. The NRC review of your response to the NOV will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

In accordance with Title 10 of the *Code of Federal Regulations* (CFR) Section 2.390 of the NRC's "Rules of Practice and Procedure," a copy of this letter and its enclosures will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

Should you have any questions concerning these inspections, please contact Leonard Pitts of my staff at 404-997-4708.

Sincerely,

/RA/

Omar R. López-Santiago, Chief
Projects Branch 1
Division of Fuel Facility Inspection

Docket No. 70-143
License No. SNM-124

Enclosures:

1. Notice of Violation
2. NRC Inspection Report 70-143/2018-002
w/Attachment: Supplementary Information

cc: (See page 3)

cc:

Jon A. Hagemann
Operations Director
Nuclear Fuel Services, Inc.
Electronic Mail Distribution

Richard J. Freudenberger
Safety & Safeguards Director
Nuclear Fuel Services, Inc.
Electronic Mail Distribution

Debra G. Shults
Director, TN Dept. of Environment & Conservation
Electronic Mail Distribution

Doris D. Hensley
Mayor, Town of Erwin
211 N. Main Avenue
P.O. Box 59
Erwin, TN 37650

Greg Lynch
Mayor, Unicoi County
P.O. Box 169
Erwin, TN 37650

Johnny Lynch
Mayor, Town of Unicoi
P.O. Box 169
Unicoi, TN 37692

David W. Deming
Manager, Program Field Office – NFS
Naval Nuclear Laboratory
1205 Banner Hill Rd
Erwin, TN 37650

SUBJECT: NUCLEAR FUEL SERVICES, INC. – U. S. NUCLEAR REGULATORY
COMMISSION INTEGRATED INSPECTION REPORT NUMBER 70-143/2018-002,

DISTRIBUTION:

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L. Cuadrado-Carabollo, NMSS

O. López-Santiago, RII

R. Johnson, NMSS

K. Ramsey, NMSS

L. Harris, RII

L. Pitts, RII

C. Rivera, RII

NFS Website

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ADAMS: Yes ACCESSION NUMBER:18109A306 SUNSI REVIEW COMPLETE FORM 665 ATTACHED

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NOTICE OF VIOLATION

Nuclear Fuel Services, Inc.
Erwin, TN

Docket No. 70-143
License No. SNM-124

During an NRC inspection conducted from February 5 to February 8, 2018, two examples of a violation of NRC requirements were identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

License condition S-1 states, in part, that the license is for "use in accordance with the statements, representations, and conditions in the application." The two examples are listed below:

Section 4.7, "Radiological Surveys and Monitoring," Subsection 4.7.12.4, "Criticality Detection System" of the License Application states, in part, "The criticality alarm system meets the guidance established in ANSI/ANS (American National Standards Institute/American Nuclear Standard) 8.3 (1997), Criticality Accident Alarm Systems."

- a. ANSI/ANS 8.3, "Criticality Accident Alarm System," Section 5.6, "Detection Criterion," requires that, "Criticality alarm systems shall be designed to respond immediately to the minimum accident of concern."
- b. ANSI/ANS 8.3, "Criticality Accident Alarm System," Section 6.4, "Periodic Tests," requires that, "The entire alarm system shall be tested periodically."

Contrary to the above, from October 1, 2011 to February 9, 2018, the licensee did not (1) design the Criticality Accident Alarm System (CAAS) to be able to respond to the minimum accident of concern while in Storm Mode and (2) perform tests of the Storm Mode logic when periodically testing the CAAS.

This is a Severity Level IV violation (Section 6.2).

Pursuant to the provisions of 10 CFR 2.201, Nuclear Fuel Services, Inc. is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, Region II, and a copy to the NRC Resident Inspector at Nuclear Fuel Services within 30 days of the date of the letter transmitting this Notice of Violation. This reply should be clearly marked as a "Reply to a Notice of Violation," and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken; and (4) the date when full compliance will be achieved.

Your response may reference or include previous docketed correspondence, if the correspondence adequately addresses the required response. If an adequate reply is not received within the time specified in this Notice of Violation, an order or a Demand for Information may be issued as to why the license should not be modified, suspended, or revoked, or why such other action as may be proper should not be taken. Where good cause is shown, consideration will be given to extending the response time.

Enclosure 1

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document Agency Documents Access and Management System, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> to the extent possible, it should not include any personal, privacy, proprietary, or safeguards information so that it can be made available to the public without redaction.

If personal, privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information.

If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information).

If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

If Classified Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR Part 95.

In accordance with 10 CFR 19.11, you may be required to post this NOV within two working days.

Dated this 19th day of April, 2018

U. S. NUCLEAR REGULATORY COMMISSION
REGION II

Docket No.: 70-143

License No.: SNM-124

Report No.: 70-143/2018-002

Licensee: Nuclear Fuel Services, Inc.

Facility: Nuclear Fuel Services, Inc.

Location: Erwin, TN 37650

Dates: January 1 through March 31, 2018

Inspectors: L. Harris, Senior Resident Inspector
L. Pitts, Senior Fuel Facility Inspector
B. Adkins, Senior Fuel Facility Inspector
T. Sippel, Fuel Facility Inspector
K. Womack, Fuel Facility Inspector
L. Cooke, Fuel Facility Inspector

Approved by: O. López-Santiago, Chief
Projects Branch 1
Division of Fuel Facility Inspection

EXECUTIVE SUMMARY

Nuclear Fuel Services, Inc.
NRC Integrated Inspection Report 70-143/2018-002
January 1 – March 31, 2018

Inspections were conducted by the resident and regional inspectors during normal and off-normal hours in safety operations, radiological controls, effluent control and environmental protection, transportation, as well as other areas. The inspectors performed a selective examination of licensee activities that was accomplished by direct observation of safety-significant activities and equipment, tours of the facility, interviews and discussions with licensee personnel, and a review of facility records. One Severity Level (SL) IV violation (VIO) of NRC requirements was identified.

Safety Operations

- Plant operations were performed safely and in accordance with license requirements. Items relied on for safety were properly implemented and maintained in order to perform their intended safety function. (Paragraphs A.1 and A.2)
- An NRC-identified, SL IV violation of criticality accident alarm system requirements was identified in the area of nuclear criticality safety. (Paragraph A.4)
- The Fire Protection program and systems were adequately maintained in accordance with the License Application and regulatory requirements. (Paragraph A.5)

Radiological Controls

- The licensee adequately implemented the Radiation Protection program consistent with the License Application and regulatory requirements. (Paragraph B.1)

Facility Support

- The post maintenance testing and surveillance programs were implemented in accordance with the License Application and regulatory requirements for work control and safety-related equipment testing. (Paragraphs C.1 and C.2)
- Adverse conditions were adequately identified, evaluated, and entered into the corrective action program. (Paragraph C.3)
- The Emergency Preparedness Program was implemented in accordance with the Emergency Plan and regulatory requirements (Paragraph C.4)

Other Areas

None

Attachment:

Supplemental Information

REPORT DETAILS

Summary of Plant Status

The following facility process areas were operating during the inspection period: Naval Fuel Manufacturing Facility (FMF) and the Blended Low Enriched Uranium (BLEU) Preparation Facility (BPF) which includes the Uranium (U)-Metal, U-Oxide, Solvent Extraction and the down-blending lines.

A. Safety Operations

1. Plant Operations Routine (Inspection Procedures (IPs) 88135 and 88135.02)

a. Inspection Scope

The inspectors performed routine tours of the fuel manufacturing areas housing Special Nuclear Material (SNM), reviewed log sheets; and interviewed operators, front-line managers, maintenance mechanics, radiation protection (RP) staff, laboratory managers, and process engineering personnel regarding issues with plant equipment and to verify the status of the process operations. The inspectors observed operational and shift turnover meetings throughout the inspection period to gain insight into safety and operational issues.

During the inspection period, the inspectors interviewed operators, front-line managers, maintenance technicians, engineers, RP technicians, and nuclear materials control technicians to verify that each of the individuals demonstrated adequate knowledge of the nuclear criticality safety (NCS) posting requirements, hazards, and the operations procedures associated with their assigned duties.

The routine tours included walk-downs of the FMF, BPF, commercial development line areas, miscellaneous storage areas, the Waste Water Treatment Facility (WWTF), and Building 440. During routine tours, the inspectors verified that operators were knowledgeable of their duties and attentive to any alarms or annunciators at their respective stations.

The inspectors observed activities during normal and upset conditions to verify that operators complied with procedures and material station limits. The inspectors noted that safety controls, including Item Relied On For Safety (IROFS), were in place, properly labeled, and functional to ensure proper control of SNM.

The inspectors verified the adequacy of communications between supervisors and operators within the operating areas. The inspectors reviewed operator log books, standard operating procedures (SOPs), maintenance records, and Letters of Authorization (i.e., temporary procedures) to obtain information concerning operating trends and activities. The inspectors verified that the licensee actively pursued corrective actions for conditions requiring temporary modifications and compensatory measures.

The inspectors performed periodic tours of the outlying facility areas to determine that equipment and systems were operated safely and in compliance with the license. The inspectors focused on potential wind-borne missile hazards, potential fire hazards with

combustible material storage and fire loading, hazardous chemical storage, the physical condition of bulk chemical storage tanks and piping, storage of compressed gas containers, and potential degradation of plant security features. The inspectors attended various plan-of-the-day meetings and met daily with the Plant Shift Superintendent throughout the inspection period in order to determine the overall status of the plant. The inspectors evaluated the adequacy of the licensee's response to significant plant issues as well as their approach to solving various plant problems during these meetings.

b. Conclusion

No violations of more than minor significance were identified.

2. Safety System Inspection (IP 88135.04)

a. Inspection Scope

The inspectors performed walk-downs of safety-significant systems involved with the processing of SNM. As part of the walk-downs, the inspectors verified as-built configurations matched approved plant drawings.

The inspectors interviewed operators to confirm that plant personnel were familiar with the assumptions and controls associated with the IROFS systems and instrumentation for maintaining plant safety. The inspectors also verified that IROFS assumptions and controls were properly implemented in the field.

The inspectors reviewed the related Integrated Safety Analysis (ISA) to verify system abilities to perform functions were not affected by outstanding design issues, temporary modifications, operator workarounds, adverse conditions, or other system-related issues. The inspectors also verified that there were no conditions that degraded plant performance and the operability of IROFS, safety-related devices, or other support systems essential to safety system performance. Safety significant functions, tests, and inspections to assure operability of the safety system for dissolution area in the 333 production area was specifically inspected. Associated performance tests for selected safety-related items N333XDISOLV3B05 and N333VALVEBA3B25 were also reviewed.

To determine the correct system alignment, the inspectors reviewed procedures, drawings, related ISAs, and regulatory requirements such as Title 10 of the *Code of Federal Regulations* (10 CFR) Section 70.61, "Performance Requirements." During the walk-downs, the inspectors verified all or some of the following as appropriate:

- Controls in place for potential criticality, chemical, radiological, and fire safety hazards
- Process vessel configurations maintained in accordance with NCS Evaluations
- Correct valve position and potential functional impacts such as leakage
- Electrical power availability
- Major system components correctly aligned, labeled, lubricated, cooled, and ventilated
- Hangers and supports correctly installed and functional
- Lockout/Tag-Out program appropriately implemented

- Cabinets, cable trays, and conduits correctly installed and functional Visible cabling in good material condition
- No interference of ancillary equipment or debris with system performance

b. Conclusion

No violations of more than minor significance were identified.

3. Nuclear Criticality Safety (IP 88135.02)

a. Inspection Scope

During daily production area tours, the inspectors verified that various criticality controls were in place, that personnel followed criticality station limit cards, and that containers were adequately controlled to minimize potential criticality hazards. The inspectors reviewed a number of criticality-related IROFS for operability. The inspectors noted that operators were knowledgeable of the requirements associated with IROFS. The inspectors performed the tours inside various process areas when SNM movements were taking place within the facility.

As part of the routine day-to-day activities on-site, the inspectors reviewed corrective action program (CAP) entries associated with criticality safety aspects. The inspectors evaluated the licensee's response to such entries and had discussions with NCS engineers and production personnel to determine safety significance and compliance with procedures.

b. Conclusion

No violations of more than minor significance were identified.

4. Nuclear Criticality Safety (IP 88015)

a. Inspection Scope

Criticality Analysis

The inspectors reviewed selected nuclear criticality safety evaluations (NCSEs) to verify that they were consistent with the commitments in the License Application, including consideration of the double contingency principle, assurance of sub-criticality under normal and credible abnormal conditions with the use of subcritical margin, technical practices and methodologies, and treatment of NCS parameters. The inspectors focused their review on NCSE 54X-12-0010, Nuclear Criticality Safety Evaluation for Area LA.

The inspectors reviewed the licensee's generation of accident sequences to determine whether the NCSE systematically identified normal and credible abnormal conditions in accordance with the commitments and methodologies in the License Application for the analysis of process upsets. This included the review of accident sequences/upsets that the licensee determined to be not credible to determine whether the bases for incredibility were consistent with the commitments, definitions, and methodologies in the License Application, and were documented in sufficient detail to permit an independent

assessment of credibility. Additionally, the inspectors reviewed selected accident sequences designated as not credible to determine whether the bases for incredibility rely on any items which should be identified as formal NCS controls or IROFS. The inspectors verified no changes were made to the validation report since the last NCS inspection.

Criticality Implementation

The inspectors performed focused walk-downs in Area LA, to determine whether existing plant configuration and operations were covered by, and consistent with, the process description and safety basis in the selected NCSE listed above. The inspectors also performed general walk-downs throughout SNM handling areas including the 440 Building. The inspectors reviewed system descriptions and drawings to verify that engineered controls established in the NCSE were included. The engineered controls reviewed included safe geometry components, scales for mass logs, and passive moderator controls.

The inspectors reviewed SOP-401-41 and associated postings to verify that selected administrative controls established in the NCSE were included. The administrative controls reviewed focused on mass logs and requirement for cleanouts. The inspectors interviewed operators and engineers to verify that administrative actions established in the NCSE were understood and implemented properly.

The inspectors reviewed the Integrated ISA Summary and supporting ISA documentation to determine whether the controls identified in the ISA were supported by technical basis in the NCSE.

Criticality Operational Oversight

The inspectors interviewed operations staff to determine whether they were cognizant of NCS hazards and control methods as they relate to their specific job function.

The inspectors reviewed records of recent NCS audits and accompanied a licensee NCS engineer on a walk-down of the 100 and 200 Areas to determine whether NCS staff routinely assesses field compliance with established NCS controls. Additionally, the inspectors interviewed NCS engineers and management to verify that the NCS function performed these NCS walk-downs weekly as required by Section 5.3.4 of the License Application. The records of NCS audits reviewed included NCS-2017-33, NCS-2017-34, NCS-2017-35, NCS-2017-38, NCS-2017-39, and NCS-2018-01.

The inspectors reviewed the applied management measures (e.g., procedures, training, calibration) for selected NCS controls to determine whether the management measures were sufficient to ensure the availability and reliability of NCS controls.

The inspectors observed licensee staff perform non-destructive assay (NDA) scans of equipment, piping, and ductwork; reviewed instrument calibration records (including Ludlum Measurements, Inc., Certificate of Calibration, Serial Nos. PR329996 and PR355013); and interviewed licensee operators, NDA specialists, and managers to verify that the licensee has established controls on long-term accumulations. The inspectors specifically walked down the equipment in Area LA, interviewed an operator, and reviewed the NCSE and operating procedure SOP-401-41 to verify that accumulations were being managed and were appropriately considered in the NCSE.

The inspectors reviewed NDA practices and assumptions contained in NFS-ACC-066 to verify that equipment was appropriately calibrated and the licensee accounted for uncertainties in material characterization, geometric configuration, and measurement error with sufficient margin.

Criticality Programmatic Oversight

The inspectors reviewed the most recent revision to the NCS program procedure, NFS-GH-913, "Nuclear Criticality Safety Program," which added a description of the use of NDA measurements as controls, and interviewed licensee engineers and operators about the implementation of NDA controls, to determine whether the licensee implemented the NCS program in accordance with the revised procedure. The inspectors also interviewed NCS staff and reviewed records to determine whether NCS staff reviewed changes to fissile material operations consistent with program procedures and at a level commensurate with their significance.

The inspectors reviewed the selected NCSE to verify that it was performed in accordance with NCS program procedures by trained and qualified NCS engineers and received appropriate independent review and approval as required by the License Application.

Criticality Incident Response and Corrective Action

The inspectors interviewed licensee managers and reviewed records to determine whether the licensee maintained emergency response capability consistent with emergency plans and procedures, and verified by drills and exercises. The inspectors interviewed the NCS manager and NCS staff on the fire brigade to verify that qualified NCS staff was readily available to advise the licensee in an emergency.

The inspectors reviewed emergency procedure NFS-HS-E-02 to determine whether the procedures specify that personnel evacuate to accountability points in the event of a criticality alarm, and whether evacuation drills were conducted consistent with license commitments and whether lessons learned were appropriately entered into the licensee's CAP.

The inspectors also conducted walk downs, reviewed licensee dose assessments, and interviewed licensee managers and engineers to verify if evacuation routes and accountability points are designed to minimize the potential for exposing evacuating personnel to radiation.

The inspectors reviewed the procedure and electronic equipment used to verify personnel accountability following a criticality accident. The inspectors conducted interviews with licensee staff, and walked down licensee equipment to verify that the licensee had monitoring instrumentation to promptly assess dose to potentially exposed individuals and to aid in safe reentry and recovery, and whether provisions were in place for the prompt decontamination and medical treatment of exposed individuals. The records reviewed included 21T-17-0527, NFS Annual Criticality Alarm Evacuation Drill, dated April 18, 2017.

The inspectors reviewed various aspects of the Criticality Accident Alarm System (CAAS) to determine whether the CAAS features met regulatory requirements and License Application commitments. This review focused on the licensee's use of Storm Mode, and included whether the CAAS was designed and implemented so as to minimize false alarms, and whether components were resistant to environmental conditions and natural phenomena.

The inspectors conducted interviews and reviewed documentation to determine whether appropriate alarm coverage was provided for all areas where required in accordance with Section 4.7.12.4 of the Licensee Application. The inspectors observed CAAS testing and reviewed test records to determine whether alarm signals were audible within the areas required to be evacuated.

The inspectors reviewed records and interviewed cognizant licensee staff to determine whether CAAS detector operability was maintained, including whether detectors were calibrated, whether all components were functionally tested, whether alarm set points were set to promptly actuate upon detecting the minimum accident of concern, and whether access to alarm set points was strictly controlled.

b. Conclusion

An NRC-identified, SL IV violation of CAAS requirements was identified in the area of NCS.

VIO 70-143/2018-002-001: Failure to Meet Criticality Accident Alarm System Requirements

Introduction: The NRC identified a Severity Level (SL) IV violation (VIO) of License Application, Section 4.7.12.4, "Criticality Detection System," with two examples. First, the licensee failed to ensure that, while in Storm Mode, their CAAS would respond to the minimum accident of concern, as required by ANSI/ANS-8.3, Section 5.6, "Detection Criterion." Second, the licensee failed to periodically test the Storm Mode logic when they tested their CAAS, as required by ANSI/ANS-8.3, Section 6.4, "Periodic Tests."

Description: The licensee uses Storm Mode to minimize false alarms during thunderstorms and maintenance. In Storm Mode, the normal system logic of a detector pair alarming to activate the CAAS is replaced with a set of four or more detectors needing to alarm to activate the CAAS. Storm Mode is implemented by a programmable logic controller (PLC) located adjacent to the hardwired CAAS control panel.

Storm Mode was installed on October 1, 2011, because the CAAS had been inadvertently activated by both thunderstorms and construction vibration. Excessive vibrations can set off the CAAS detectors, which had been periodically occurring with both detectors in the detector pair going into alarm and inappropriately activating the CAAS. Storm Mode required multiple, non-co-located detectors to alarm simultaneously, thus reducing the CAAS activations and subsequent evacuations. Based on the information reviewed, the inspectors concluded that the licensee did not have a technical basis (i.e., from modelling) demonstrating that the minimum accident of concern would activate enough detectors (i.e., expose them to 20 mrem/hr or more) to trigger the CAAS to alarm, depending on the location and magnitude of the criticality accident. Section 4.7.12.4 of the License Application states, in part, that "The system is demonstrated to respond to a minimum criticality accident of concern.... The criticality

alarm system meets the guidance established in ANSI/ANS 8.3, Criticality Accident Alarm Systems.” ANSI/ANS 8.3 Section 5.6, “Detection Criterion,” requires, in part, that “Criticality alarm systems shall be designed to respond immediately to the minimum accident of concern.” In 2011, this was noted in the licensee’s change package, ECR20111165, CAAS Storm Mode, which stated in reference to the ANSI/ANS requirement, that “there are no computer models to demonstrate that every SNM location in 301 will produce 20 mrem/hr at all four detectors for the minimum accident of concern.”

Additionally, the licensee failed to periodically test the Storm Mode PLC logic as required by ANSI/ANS-8.3, Section 6.4, “Periodic Tests.” Specifically, Section 6.4 requires, in part, that “The entire alarm system shall be tested periodically.” The inspectors determined that the CAAS system is tested on a periodic basis; however, the Storm Mode PLC logic was only tested at the time of installation in 2011.

Following identification of this issue, the licensee issued a Letter of Authorization prohibiting the use of Storm Mode on February 9, 2018, and had entered the issue into their Problem Identification Resolution and Correction System (PIRCS) as item 63291.

Analysis: As required by Section 4.7.12.4 of the License Application, the licensee failed to implement the requirements of ANSI/ANS 8.3. Specifically, the licensee failed to (1) meet Section 5.6 which states that the system shall be designed to respond to the minimum accident of concern and (2) meet Section 6.4 which required the entire alarm system to be periodically tested.

This issue is more than minor because it aligns with the Enforcement Policy Example 6.2(d)(5), for an SL IV Violation, which states, “Under 10 CFR 70.24 ... a criticality accident alarm system fails to provide either detection or annunciation coverage of fissile material operations during a time period when fissile material was handled, used, or stored.” This issue also aligns with screening question 10 in Inspection Manual Chapter (IMC) 0616 Appendix B which states, “Does the violation result in the criticality accident alarm system being unable to detect or activate an alarm signal (audible or visual) during a time period when fissile material was handled, used, or stored?”

The issue is also similar to NCS Examples g and k from IMC 0616 Appendix B which indicate that the issue is more than minor due to failure to perform a post-maintenance test and failure to maintain the CAAS as required by 70.24, respectively.

This violation was in existence from the implementation of Storm Mode, on October 1, 2011, to February 9, 2018; however, the time period of the CAAS outage itself was not substantial because Storm Mode was only in effect for a short time each activation. When considered cumulatively, the total time in Storm Mode per year was estimated to be well less than 30 days. The actual significance of the violation was none because no criticality occurred during that period. The potential significance was high, because the CAAS was not designed to detect the minimum accident of concern while in Storm Mode—although, criticalities that produce more radiation than the minimum accident of concern would have been more likely to be detected by the system.

Enforcement: License condition S-1 states, in part, that the license is for “use in accordance with the statements, representations, and conditions in the application.” Section 4.7, “Radiological Surveys and Monitoring,” Subsection 4.7.12.4, “Criticality

Detection System” of the License Application states, in part, “The criticality alarm system meets the guidance established in ANSI/AS 8.3 “Criticality Accident Alarm Systems.” ANSI/ANS 8.3 “Criticality Accident Alarm System,” Section 5.6, “Detection Criterion,” requires that, “Criticality alarm systems shall be designed to respond immediately to the minimum accident of concern.” While Section 6.4, “Periodic Tests,” requires that, “The entire alarm system shall be tested periodically.”

Contrary to the above, from October 1, 2011 to February 9, 2018, (1) the licensee did not design the CAAS to be able to respond to the minimum accident of concern while in Storm Mode; and (2) the licensee did not perform tests of the Storm Mode logic when periodically testing the CAAS. This SL IV violation will be documented as VIO 70-143/2018-002-01, Failure to Meet Criticality Accident Alarm System Requirements.

5. Fire Protection Quarterly (IP 88135.05)

a. Inspection Scope

During routine plant tours, the inspectors verified that transient combustibles were being adequately controlled and minimized in selected process areas. Various fire barriers and doors were examined to determine whether they were properly maintained and functional in accordance with site procedures. The inspectors reviewed active fire impairments in selected process areas to determine whether they were implemented per site procedure.

The inspectors conducted a walk-down of Buildings 301 (calciner area) and 105 (laboratory) and to determine whether that the Pre-Fire plan drawing matched the as-found condition for various fire protection components like extinguishers, and postings. The inspectors reviewed the fire water supply to the surrounding area fire hydrants to verify it was properly aligned for operational status. The inspectors also reviewed qualifications of selected staff assigned to the areas regarding fire suppression systems.

The inspectors reviewed a sampling of fire-related PIRCS entries to verify that corrective actions were appropriate and that appropriate compensatory actions were implemented as applicable.

b. Conclusion

No violations of more than minor significance were identified.

B. Radiological Controls

1. Radiation Protection Quarterly (IP 88135.02)

a. Inspection Scope

During tours of the production areas, the inspectors observed RP controls and practices implemented during various plant activities including the proper use of personnel monitoring equipment, required protective clothing, and frisking methods for detecting radioactive contamination on individuals exiting contamination controlled areas. The inspectors verified that plant workers properly wore dosimetry and used protective clothing in accordance with applicable Special Work Permits (SWPs). The inspectors

also verified that radiation area postings complied with plant procedures and included radiation maps with up-to-date radiation levels. The inspectors monitored the operation of RP instruments and verified calibration due dates.

The inspectors performed numerous partial reviews of SWPs during the inspection period in different operational areas, but conducted a more thorough review for the following SWPs and posted radiologically controlled areas:

- SWP 16852 301 RCPT
- SWP 16875 333 OVERHEAD
- SWP 16879 333 UAL

b. Conclusion

No violations of more than minor significance were identified.

C. Facility Support

1. Post Maintenance Testing (IP 88135.19)

a. Inspection Scope

The inspectors witnessed and/or reviewed the post-maintenance tests (PMTs) listed below to verify that procedures and test activities confirmed safety systems and components (SSCs) operability and functional capability following the described maintenance.

The inspectors reviewed the licensee's completed test procedures to ensure any of the SSC safety function(s) that may have been affected were adequately tested, that the acceptance criteria were consistent with information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved.

The inspectors also witnessed and/or reviewed the test data to verify that test results adequately demonstrated restoration of the affected safety function(s). The inspectors verified that PMT activities were conducted in accordance with applicable work order instructions or licensee procedural requirements. Furthermore, the inspectors verified that problems associated with PMTs were identified and entered into the licensee's PIRCS.

- SRE Test: N333DISSLVLSYSA
- SRE Test: N333DISSLVLSYSB
- SRE Test: N302FURDOOR600A

b. Conclusion

No violations of more than minor significance were identified.

2. Surveillance Testing (IP 88135.22)

a. Inspection Scope

The inspectors witnessed portions of and/or reviewed completed test data for the following surveillance tests of risk-significant and/or safety-related systems to verify that the tests met the requirements of the ISA, commitments, and licensee procedures. The inspectors confirmed the testing effectively demonstrated that the SSCs were operationally capable of performing their intended safety functions and fulfilled the intent of the associated safety-related equipment (SRE) test requirement.

The inspectors discussed surveillance testing requirements with operators performing the associated tasks and determined that their procedural knowledge was adequate. The inspectors verified that any test equipment or standards used to conduct the test were within calibration.

- SRE Test N306XXXXPCVCW13
- SRE Test N302XXAREAGHTRS
- SRE Test N303XWOGVNT0C01

b. Conclusion

No violations of more than minor significance were identified.

3. Corrective Action Program (CAP) Review (IP 88135)

a. Inspection Scope and Observations

The inspectors reviewed the PIRCS to ensure that items adverse to safety were being identified and tracked to closure in accordance with program procedures. The inspectors routinely attended daily PIRCS screening committee meetings and periodic Corrective Action Review Board meetings to evaluate site management's response and assignment of corrective actions or investigations to various issues. The inspectors also performed daily screenings of items entered into the CAP to aid in the identification of repetitive equipment failures or specific human performance issues for follow-up.

The inspectors reviewed CAP entries that occurred during the inspection period to assess and evaluate the safety significance of issues. For items identified to be more safety significant, the inspectors conducted an additional evaluation to verify the licensee was adequately addressing and correcting the issues to prevent recurrence.

b. Conclusion

No violations of more than minor significance were identified.

4. Emergency Preparedness (IP 88050)

a. Inspection Scope

The inspectors interviewed staff and reviewed records to evaluate compliance with Chapter 8.0, "Emergency Management," of License SNM-124 and NFS-GH-903,

“Emergency Plan,” Revision (Rev.) 23. The inspectors reviewed samples of implementing procedures with significant revisions since the last Emergency Preparedness (EP) inspection to verify the procedures remained in compliance with the license and the Emergency Plan.

The inspectors observed the storage of emergency equipment and procedures in the on-site Emergency Control Center (ECC), and two alternate ECCs. Inspectors also observed equipment storage near the primary assembly area equipment building. The inspectors reviewed and observed the automated personnel system at the primary and alternate assembly areas to evaluate compliance with procedures.

The inspectors reviewed written agreements between NFS and off-site agencies to verify emergency response coordination required by NFS-GH-903 was completed. The inspectors interviewed representatives from Unicoi County Memorial Hospital and MedicOne Medical Response to assess their knowledge and understanding of the written agreements. The inspectors also reviewed records and conducted interviews with off-site agencies to verify that off-site organizations were invited at least annually to participate in licensee conducted training and emergency preparedness drills. The inspectors also reviewed the training for off-site personnel to verify that it covered the topics outlined in the Emergency Plan.

The inspectors reviewed change management documentation that captured lessons learned from EP exercises that had occurred since the last inspection. The inspectors also reviewed the internal audit of the EP program since the previous inspection to verify that the EP program was meeting requirements in the license and Emergency Plan.

The inspectors reviewed training provided to emergency response personnel covering their roles and responsibilities as required by the Emergency Plan. The inspectors reviewed the licensee provided training for hypothetical emergency situations to verify the training was effective and consistent with the frequency and performance objectives required in the license and Emergency Plan.

b. Conclusion

No violations of more than minor significance were identified.

D. Special Topics

None

E. Exit Meetings

The inspection scope and results, including identification of a SL IV violation were presented to members of the licensee’s staff at various meetings throughout the inspection period and were summarized on February 8 and at the end of the quarter on April 18, 2018, to J. Duling, R. Freudenberger, other management, and staff. No dissenting comments were received from the licensee. Proprietary and classified information was discussed but not included in the report.

SUPPLEMENTAL INFORMATION

1. KEY POINTS OF CONTACT

<u>Name</u>	<u>Title</u>
C. Barron	Emergency Preparedness Manager
C. Brown	MC&A Department Section Manager
N. Brown	NCS Department Section Manager
T. Cloyd	Fire Protection Engineer
D. Deming	Manager, Program Field Office (Bettis)
J. Duling	President
J. Eidens	BMPC Program Field Office (KAPL)
J. Erwin	Operations Manager, MedicOne Medical Response
T. Evans	Security Section Manager
J. Faddis	Environmental Unit Manager
R. Freudenberger	Safety & Safeguards Director
S. Gizzie	NCS Engineer
J. Griffith	Environmental Scientist
J. Hagemann	Work Management Section Manager
A. Jones	Director of Nursing, Unicoi County Memorial Hospital
T. Knowles	Licensing Manager
J. Marshall	NCS Engineer
R. Mauer	ISA Manager
J. May	T&WM Ops Unit Manager
B. McKeehan	Transportation and Waste Unit Manager
M. McKinnon	Operations Director
B. M. Moore	Environmental Protection & Industrial Safety Section Manager
A. Morie	Safety & Safeguards Program Manager
J. Nagy	Nuclear Safety Officer Chief
B. Rice	NCS Engineer
R. Rice	Radiation Protection and Health Physics Unit Manager
S. Sanders	Training Manager
R. Shackelford	Nuclear Safety & Licensing Section Manager
S. Skiles	NCS Engineer
R. Storey	Configuration Management Unit Manager

2. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

VIO 70-143/2018-002-01	Failure to Meet Criticality Accident Alarm System Requirements (Paragraph A.3)
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Discussed

None

Closed

None

3. INSPECTION PROCEDURES USED

88135	Resident Inspector Program For Category I Fuel Cycle
88135.02	Plant Status
88135.04	ISA Implementation
88135.05	Fire Protection
88135.17	Permanent Plant Modifications
88135.19	Post Maintenance Testing
88135.22	Surveillance Testing
88015	Nuclear Criticality Safety
88050	Emergency Preparedness

4. DOCUMENTS REVIEWED

Records:

21T-17-0527, NFS Annual Criticality Alarm Evacuation Drill, dated April 18, 2017

27T-17-0139, Emergency Response Organization Annual Training

27T-17-0174, Annual Refresher Training

54T-02-0013, Nuclear Criticality Safety Evaluation for the Uranium Metal Sampling Area, Rev. 0

54X-12-0010, Nuclear Criticality Safety Evaluation for Area LA, Rev. 4

56T-17-0188, Emergency Preparedness Audit (QA-17-26), dated December 13, 2017
Agreement between MedicOne Medical Response and Nuclear Fuel Services, Inc., dated July 14, 2017

ECR No. 20111165, CAAS Storm Mode, dated October 1, 2011

Formal Work Package (FWP) # 156130

Letter of Agreement – Radiation Emergency assistance Center/Training Site Support, dated October 19, 2015

NCS-2017-33, Ninth Nuclear Criticality Safety Evaluation for the Tube Cleaning Room of the Production Fuel Facility, dated November 17, 2017

NCS-2017-34, Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for the CDL Interaction Analysis, dated November 7, 2017

NCS-2017-35, Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for Sublimation Stations Number 1 and 2 and the Cylinder Test and Overpack Station, dated November 13, 2017

NCS-2017-38, 2017 Nuclear Criticality Safety (NCS) Audit of the Training Program, dated January 3, 2017

NCS-2017-39, Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for Waste Water Treatment Facility, dated December 12, 2017

NCS-2018-01, Fourth Nuclear Criticality Safety Audit of the Nuclear Criticality Safety Evaluation for Sublimation Station Number 3, the Heel Removal Station, and the NaF/Alumina Traps, dated February 1, 2018

NFS Emergency Personnel Call List, Rev. 43, dated January 2018

Updating Agreement between the Erwin Fire Department and Nuclear Fuel Services, Inc., dated July 14, 2017

Updating Agreement between Mountain States Health Alliance d/b/a Johnson City Medical Center and Nuclear Fuel Services, Inc., dated August 2, 2017

Updating Agreement between the South Unicoi County Volunteer Fire Department and Nuclear Fuel Services, Inc., dated July 14, 2017

Updating Agreement between the Town of Erwin and Nuclear Fuel Services, Inc., dated July 14, 2017

Updating Agreement between the Unicoi County Memorial Hospital and Nuclear Fuel Services, Inc., dated October 13, 2016

Procedures:

NFS-ACC-066, Procedure for Yearly NDA of Process Exhaust Ventilation System, Rev. 9
 NFS-ACC-113, Actions, Notifications, and Investigations Guidance, Rev. 007
 NFS-GH-43, Safety Related Equipment Control Program, Rev. 028
 NFS-GH-903, Emergency Plan, Rev. 20.A, dated June 2016
 NFS-GH-903, Emergency Plan, Rev. 21, dated November 2016
 NFS-GH-903, Emergency Plan, Rev. 22, dated June 2017
 NFS-GH-903, Emergency Plan, Rev. 23, dated September 2017
 NFS-GH-913, Nuclear Criticality Safety Program, Rev. 4
 NFS-HS-A-05, SRE N000XCRITDETSYS/SRE N000CAASSEMANN
 NFS-HS-A-21, Operation and Testing of the Criticality, Fire and CO₂ Alarm Systems, Rev. 32
 NFS-HS-E-02, Emergency Criticality Evacuation, Rev. 45, dated September 2017
 NFS-HS-E-03, Emergency Response Organization, Rev. 31, dated September 2017
 NFS-HS-E-05, Spill Response and Reporting, Rev. 36, dated September 2017
 NFS-HS-E-07, On-Site Radiological Emergency Assessment, Rev. 34, dated September 2017
 NFS-HS-E-08, Off-Site Radiological Emergency Assessment, Rev. 29, dated September 2017
 NFS-HS-E-09, Off-Site Dose Projection for Radiological Emergency, Rev. 29, dated June 2017
 NFS-HS-E-10, Emergency Communications, Rev. 29, dated September 2017
 NFS-HS-E-12, 24-Hour Emergency Response for Hazardous Material Transportation, Rev. 22, dated June 2017
 NFS-HS-E-13, Emergency Take Cover, Rev. 8, dated September 2017
 NFS-HS-E-14, CO₂ Evacuation Alarm Response and Responsibilities, Rev. 14, dated September 2017
 NFS-HS-E-15, Emergency Medical Response, Rev. 17, dated September 2017
 SOP-401-41, Fuel Manufacturing Facility Area LA, Rev. 23

Other Documents:

304-F0376-D, Area LA P&ID Sheet 1
 304-F0377-D, Area LA P&ID Sheet 2
 304-F0378-D, Area LA P&ID Sheet 3
 Functional Design Specification Criticality Monitoring Supervisory System, Rev. 4, dated May 23, 2012.
 Ludlum Measurements, Inc., Certificate of Calibration, Serial No. PR329996, dated October 28, 2013
 Ludlum Measurements, Inc., Certificate of Calibration, Serial No. PR355013, dated December 24, 2015
 NFS_Criticality_System_SR156130_9_19_11.ACD, PLC Software Generation and Revision Checklist, dated September 29, 2011
 NFS-ACC-047, Rev. 8, Att. C, New NDA Factors Sheet, dated October 12, 2017
 NFS-ACC-121, Procedure for Operation of Portable NDA Systems
 Project JA0584 Criticality Accident Alarm System Replacement (CAAS)

PIRCS Written as a Result of the Inspection:

63160, 63214, 63223, 63291, 63380, 63832,

PIRCS Reviewed:

30420, 58664, 58665, 60829, 61182, 61320, 61592, 61593, 61594, 61595, 63072, 63128,
63178, 61457, 61792, 61794, 61799, 61800, 61806, 61810, 61809, 61778, 61815, 61841,
61873, 61876, 61940, 61943, 61950, 61970, 61971, 61975, 63008, 63011, 63028, 63136,
63184, 63186, 63240, 63266, 63269, 63285, 63331, 63387, 63409, 63411, 63547, 63603,
63644, 63648, 63651, 63658, 63673, 63743, 63718, 63784, 63808,